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MAIN LECTURE

A multi-factorial approach to the nutritional requirements of sports horses: critical analysis and some practical applications

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ABSTRACT: The main objectives for the correct feeding of the horses is to provide them all the nutrients required to satisfy the organism's needs and all the substances that can help to avoid metabolic problems and to use energy substrates and different nutrients sources in proper way. Many factors can influence the success of a feeding plan such as owner expectations, metabolic and digestive differences among horses, and stable conditions. Moreover the estimation in field conditions of nutritional requirements is usually performed by empirical way and not always estimated with care. It is generally based on the observation of the work performed as judged by rider and the Body Condition Score of the horse. As a result the nutritional requirements of the horse are frequently misjudged. In particular energy expenditure for exercise is often correlated to the riders perception or horse work attitude. To try to assess the workload in proper way, it is then important to try using new tools to better understand the real needs of sport horses. For this reason, new areas are nowadays explored and new techniques applied to sport horses.

Key words: Horse, Nutrition, Workload, Requirements.

INTRODUCTION – In the last years the sport horse's market increased worldwide. This encouraged new researches for studying the factors that can influence the horse's performances. In particular the main objectives for the correct feeding of the horses is to provide them all the nutrients required to satisfy the organism's needs and all the substances that can help to avoid metabolic problems and to use energy substrates and different nutrients sources in proper way (Bergero, 2004). Today horses are involved in very difficult competitions that require a perfect fitness condition. Feed intake should be increased as the work rate increases (Frape, 2004) but to assess the exact amounts of work that a horse performs during training or competition is not so easy. In fact many factors can influence the success of a feeding plan such as owner expectations, metabolic and digestive differences among horses, and stable conditions. In addition there is a fundamental gap that is not yet solved: how to assess the exact nutritional requirements of sport horses and to link it to the type of effort required or performed? There is a lack of published information in this field. This is maybe due to the different management systems, strategy of training and feed strategies worldwide.

The estimation of nutritional requirements is generally performed in field conditions by the owner with empirical methods generally based on the observation of the work performed as judged by rider and the Body Condition Score of the horse, not always estimated with care; however the nutritional requirements are not to be estimated only on the basis of the empirical perceptions of the owners. The available feeding tables for horses mainly refer to the minimal amounts of nutrient needed to maintain the normal health, production and performance of horses (NRC, 1989; Martin-Rosset, 1990) but today a little change in the performance, during a competition, could stand for the difference between winning or losing. To try to assess the workload in proper way, it is then important to try using new tools to better understand the real needs of sport horses. For this reason, new areas are nowadays explored and new techniques applied to sport horses.

DISCUSSIONS – To establish a correct feeding plan each horse should be fed as individual (NRC, 1989); for this reason, different internal and external factors must be taken into account. In fact numerous aspects can influence the requirement of the horse and in particular the energy requirements. They include, body weight, BCS, physical

activity, environmental conditions (Lewis, 1995). So as the first step it is necessary to evaluate the management of the stable where the horse is kept. For example a protein imbalance can result in excess of nitrogen that can modify the smell of the bedding because of excess protein resulting in high rates of urea excretion and high aerial ammonia concentration (Kline, 2004). Moreover, faces inspection could be an important factor for understanding the health of the gut. Colour, odour and consistence should be appropriate because a change in this parameters could be due the diet that can produce an alteration of intestinal environmental conditions.

The observation of the horse is a fundamental point to establish the correct feeding plan. An accurate measurement of horse's weight is obviously important for the assessment of the quantity of feeds that should be given. The available methods for estimating weight include the use of ordinary tape measurements being placed into a formula. This methods is easy to use and give an appropriate estimation of the weight of the horse. Different formula are available and they could be used help to improve the accuracy of the measurements in according to a number of factors such as breed and conformation (Martin-Rosset, 1990; Bergero, 1996).

The methods of weigh tapes tends to be more accurate when used with the estimation of body condition score. In this way we obtain a correct idea of the horse body condition. Body condition scoring is a procedure for assigning a numerical score based on indicators of body fat. These scores provide a guide for the efficient feeding and management of the horses (Čačić and Ivankovic, 2001). The scoring could be accredited using the American systems (1-9) or the French systems (0-5) (Miraglia *et al.*, 1998) by using visual or ultrasound technique.

An accurate inspection of the feedstuffs offered to the horse must be also performed. In particular it is necessary to evaluate the type of hay and its quality. Feedstuffs must be evaluated analysing the label indications of raw protein, fiber, ash, and the fat content. For more accurate informations, a laboratory analysis must be performed. The quantities daily offered to the horse must be weighted using a balance to be sure of the amounts that are given to the horse daily (this aspect is very often not well known, because the rationing is performed on volume basis).

Even if all these data are obtained from the field analysis, they are not sufficient to establish the nutritional requirements of a sport horses. In particular the information collected from the owners are often improper. As a result the nutritional requirements of the horse are frequently misjudged. In particular energy expenditure for exercise is correlated to the riders perception or horse work attitude such categories of jump, endurance, dressage or tree day event. Additional factors such as the weight and the ability of the rider and the characteristic of the arena in which horse is training every day are important factor that could influence the horse requirements.

A number of studies investigated the physiological demands for different exercises in horses, but limited investigations have been performed on the physiological demands of exercise in sport horses under field conditions.

For this reason it is important to evaluate the exact quantity and quality of work that the horse perform daily in field condition. In this way we obtain sufficient data to measure with accuracy the requirements that must be added to the daily maintenance needs. Nowadays we have different tools that are useful to understand the real work that horses perform.

In ridden horses under field conditions the most commonly used variables to evaluates workload are heart rate (HR) and plasma lactate concentrations (Sloet *et al.*, 2006). Heart rate is easy to determine during exercise and there is a linear increase in HR with increasing exercise effort while blood lactate concentrations will increase as the aerobic energy contribution became insufficient to meet total energy demand (Hodgson and Rose, 1994). The rate of this increase in the blood may be used as indirect indicator of cardiovascular and metabolic involvement during the exercise because small amounts of lactate are produced at sub-maximal work rates (Jones, 1989). By measuring this parameters in field condition we could have an idea of the kind of work the horse perform during training. However it is difficult to draw conclusion to assess how hard is the work that a horse normally perform using only this methods for the incidence of many variables that are present at the moments of using. At low heart rates, this parameter can be influenced by excitement in particular in young horses and may also increase due to horse's behavioural peculiarities, field conditions, lameness and/or systemic diseases. So other systems must be used to measure the exact quantities of work that horse perform.

Global Positioning Systems (GPS) has been developed for monitoring the position and speed of human athlete exercising on the track. The technology has been proven to be reliable and accurate and has been used in conjunction with heart rate monitors to measure work intensity. This systems provide a reliable tool for measuring speeds and workload of horses too. While there is limited information that can be derived from HR during exercise in particular under certain speeds, GPS can give information how hard horse is working (Kingston *et al.*, 2006) because it gives a pictures of the kind of work that horse perform.

GPS gives many information such total time of work and the quality of the work. The data obtained could be downloaded on the PC and analysed with different training programs. In this way is possible obtain the % of time spent by the horse at the different speed (walk, trot, gallop) and use these data to assess the nutritional requirements on the basis of NRC or INRA tables, with better accuracy. In particular it is also possi-

ble to know the different speed reached by the horses and so distinguish the real kind of pace that horse perform during the training sessions.

CONCLUSIONS – To establish a correct feeding plan each horses should be fed as individuals and is important evaluate different factors such as feeds, stable management and horse characteristic. However to establish the exact nutritional requirements of sport horses avoiding problems it is useful to use the new technology such as GPS and HR monitor. In this ways it is possible to provide a detailed picture of horse training workload and intensity in field conditions.

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